4.7.2.5 Oak Ridge Reservation

4.7.2.5.1 *Land Resources*

ORR is a potential site for the storage alternatives and for the three other DOE programs identified in Table 4.7.1–1. The total area of undisturbed land that could be affected by these programs during operation is 154 ha (382 acres), or less than 1 percent of the total land at ORR. Cumulative impacts are possible to NERP lands at ORR due to encroachment of the new development projects. A portion of the consolidated storage facility could be constructed on land designated for waste management in the *ORR Site Development and Facilities Utilization Plan*. Proposed development could affect visual resources near Route 95 and Bear Creek Road by changing the current VRM class 4 to a class 5.

4.7.2.5.2 *Site Infrastructure*

Some cumulative impacts are possible at ORR resulting from implementation of the storage alternatives, ongoing activities, and the three other DOE programs identified in Table 4.7.1–1. In addition, environmental restoration activities at ORR are expected to continue for 30 years and therefore will coincide with the construction and operation of the proposed disposition facilities as well as many of the other DOE programs. Table 4.7.2.5.2–1 shows the site infrastructure cumulative impacts that would result from operation of the proposed programs were they to be sited at ORR. The cumulative requirements for oil and coal exceed the ORR site availability. Oil storage tanks and coal handling facilities would need to be constructed to meet the new resource requirements.

Table 4.7.2.5.2–1. Site Infrastructure Cumulative Operation Impacts at Oak Ridge Reservation

	Electrical		Fuel		
Requirement	Energy (MWh/yr)	Peak Load (MWe)	Oil (l/yr)	Natural Gas (m^3/yr)	Coal (t/yr)
No Action	726,000	110	379,000	95,000,000	16,300
Storage and Disposition	60,260[a]	10[a]	50,000[b]	949[a]	5,973[b]
HEU Disposition	5,000	2	56,800	0	363
Stockpile Stewardship and Management[c]	0	0	0	0	0
Waste Management	NA	88.6	NA	NA	NA
Cumulative Requirement	791,260	210.6	485,800	95,000,949	22,636
Site Availability	13,880,000	2,100	416,000	250,760,000	16,300

[a] Collocation Alternative (New Pu Storage Facility and Modify Y–12).

[b] Collocation Alternative (New Pu and HEU Storage Facilities).

[c] No Action data is used because the rest of the alternatives in the Stockpile Stewardship and Management PEIS would result in downsizing.

Note: NA=data was not analyzed in the associated EIS.

Source: DOE 1995cc; DOE 1996b; DOE 1996m; Table 4.2.5.2–1.

4.7.2.5.3 *Air Quality and Noise*

Cumulative impacts to air quality at ORR include impacts from No Action Alternative, the three other DOE programs identified in Table 4.7.1–1, and the proposed facilities for each storage alternative. Concentrations are calculated for these emissions and are then compared to Federal and State regulations and guidelines to determine compliance.

The ORR is currently in compliance with the NAAQS as well as state regulations and guidelines. Air emissions attributable to the storage alternatives would increase concentrations of criteria pollutants. Potential cumulative impacts are presented in Table 4.7.2.5.3–1. The resulting concentrations from cumulative impacts would be in compliance with Federal and State regulations.

Cumulative noise impacts include contributions from existing and planned facilities plus proposed storage facilities at the site. Noise impacts may result both from onsite noise sources and from offsite sources such as traffic. Noise impacts on individuals from the storage facilities are expected to be small, resulting in little or no increase in noise levels at offsite areas. Little or no increase in cumulative noise impacts to individuals offsite is expected to occur.

4.7.2.5.4 *Water Resources*

Table 4.7.2.5.4–1 summarizes the estimated cumulative water requirements for the storage alternatives and the three other DOE programs identified in Table 4.7.1–1. Water requirements during the operation of all the proposed projects would be obtained from the Clinch River. The cumulative water requirements for the site would be 0.3 percent of the Clinch River's average flow (135 m^3/s [4,763 ft^3/s]). The Collocation Alternative would account for approximately 2.4 percent of the cumulative usage. The additional withdrawals are minor in comparison to the average flow of the river and would not noticeably affect the local or regional water supply.

Table 4.7.2.5.4–1. Cumulative Annual Water Usage at Oak Ridge Reservation

Program	Water Requirements (million l/yr)
No Action	14,760[a]
Storage and Disposition	360[b]
HEU Disposition	19[c,d]
Stockpile Stewardship and Management	0[e]
Waste Management	814.5[c]
Total annual cumulative water usage	15,954

[a] Data include both groundwater and surface water.
[b] Number is based on the Collocation Alternative.
[c] Data represents the maximum value for the comparative alternative scenario.
[d] Based on preliminary data.
[e] The Stockpile Stewardship and Management alternatives would require no additional water.
Source: DOE 1995cc; DOE 1995dd; DOE 1996b; DOE 1996m; Table 4.2.5.4–1.

Table 4.7.2.5.4–2 summarizes the estimated cumulative water discharge to the Clinch River via Bear Creek, McCoy Branch, Rogers Quarry, and East Fork Poplar Creek. The cumulative wastewater discharge would be a 75-percent increase in the average Bear Creek flow near Y–12 (0.11 m^3/s [3.9 ft^3/s]), 5.5 percent of the average flow at East Fork Poplar Creek (1.5 m^3/s [53 ft^3/s]) and 0.06 percent of the average flow of the Clinch River (132 m^3/s [4,647 ft^3/s]). The Collocation Alternative would account for 7 percent of the total annual cumulative wastewater discharge. The expected total cumulative wastewater discharge to the tributaries would continue to meet limits and reporting requirements. Existing ORR treatment facilities could accommodate all the new cumulative process and wastewater streams.

[Text deleted.]

4.7.2.5.5 *Geology and Soils*

Cumulative impacts to geologic and soil resources are expected to be minor as a result of the storage alternatives and the other DOE programs identified in Table 4.7.1–1. A total of 154 ha (382 acres) could be disturbed at the

Table 4.7.2.5.3–1. Estimated Cumulative Operational Concentrations of Pollutants at Oak Ridge Reservation and Comparison With Most Stringent Regulations or Guidelines—No Action and Storage Alternatives

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] ($\mu g/m^3$)	No Action ($\mu g/m^3$)	Other Onsite Activities[b] ($\mu g/m^3$)	Upgrade ($\mu g/m^3$)	Collocation: New Pu Storage Facility Only ($\mu g/m^3$)	Collocation: New Pu Storage Facility and Modify Y–12 ($\mu g/m^3$)	Collocation: New Pu and HEU Storage Facilities ($\mu g/m^3$)
Criteria Pollutants								
Carbon monoxide	8-hour	10,000[c]	5	11.5	16.5	16.58	16.57	16.59
	1-hour	40,000[c]	11	62.4	73.4	73.56	73.55	73.58
Lead	Calendar Quarter	1.5[c]	0.05	<0.01	<0.06	<0.06	<0.06	<0.06
Nitrogen dioxide	Annual	100[c]	3	1.93	4.93	4.93	4.99	5.0
Ozone	1-hour	235[c]	[d]	[d]	[d]	[d]	[d]	[d]
Particulate matter less than or equal to 10 microns in diameter	Annual	50[c]	1	10.03	11.03	11.03	11.03	11.04
	24-hour	150[c]	2	30.37	32.37	32.42	32.42	32.42
Sulfur dioxide	Annual	80[c]	2	48.11	50.11	50.21	50.21	50.23
	24-hour	365[c]	32	237.5	269.5	270.6	270.5	270.8
	3-hour	1,300[c]	80	902	982	986.2	986.0	986.9
Mandated by Tennessee								
Total suspended particulates	24-hour	150[e]	2	80.16	82.16	82.21	82.20	82.21
Gaseous fluorides (as HF)	30-day	1.2[e]	0.2	0	0.2	0.2	0.2	0.2
	7-day	1.6[e]	0.3	0	0.3	0.3	0.3	0.3
	24-hour	2.9[e]	0.6[f]	0	0.6[f]	0.6[f]	0.6[f]	0.6[f]
	12-hour	3.7[e]	0.6[f]	0	0.6[f]	0.6[f]	0.6[f]	0.6[f]
	8-hour	250[e]	0.6	0	0.6	0.6	0.6	0.6

Table 4.7.2.5.3–1. Estimated Cumulative Operational Concentrations of Pollutants at Oak Ridge Reservation and Comparison With Most Stringent Regulations or Guidelines—No Action and Storage Alternatives—Continued

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines[a] ($\mu g/m^3$)	No Action ($\mu g/m^3$)	Other Onsite Activities[b] ($\mu g/m^3$)	Upgrade ($\mu g/m^3$)	Collocation: New Pu Storage Facility Only ($\mu g/m^3$)	Collocation: New Pu Storage Facility and Modify Y–12 ($\mu g/m^3$)	Collocation: New Pu and HEU Storage Facilities ($\mu g/m^3$)
Hazardous and Other Toxic Compounds								
Chlorine	8-hour	150[e]	4.1	0	4.1	4.1	4.1	4.1
Hydrogen chloride	8-hour	750[e]	57	0	57	57	57	57
Hydrazine	8-hour	1.3[e]	[g]	0	[g]	[g]	[g]	<0.01[h]
Mercury	8-hour	5[e]	0.06[i]	0	0.06[i]	0.06[i]	0.06[i]	0.06[i]
Nitric acid	8-hour	[j]	78	0	78	78	78	78
Phosphoric acid	8-hour	[j]	[g]	0	[g]	[g]	[g]	<0.01[h]
Sulfuric acid	8-hour	[j]	20	0	20	20	20	20

[a] The more stringent of the Federal and State standard is presented if both exist for the averaging time.

[b] Other onsite activities include those associated with HEU Disposition, Stockpile Stewardship and Management, and Waste Management programs.

[c] Federal and State standard.

[d] Ozone, as a criteria pollutant, is not directly emitted nor monitored by the site. See section 4.1.3 for a discussion of ozone-related issues.

[e] State standard or guideline.

[f] 8-hour concentration was used.

[g] No sources of this pollutant have been identified.

[h] The concentration represents the alternative contribution and other onsite activities.

[i] Annual average (monitored value).

[j] No State standard for indicated averaging time.

Note: Concentrations are based on site contribution and do not include the contribution from non-facility sources.

Source: 40 CFR 50; DOE 1995w; DOE 1995dd; DOE 1996b; DOE 1996m; OR DOE 1993a; OR LMES 1996i; OR MMES 1996a; TN DEC 1994a; TN DHE 1991a; Table 4.2.5.3–1.

Table 4.7.2.5.4–2. Cumulative Annual Wastewater Discharge at Oak Ridge Reservation

Program	Nonhazardous Sanitary and Industrial Wastewater (million l/yr)
No Action	2,277[a]
Storage and Disposition	172[b,c]
HEU Disposition	18.7[b]
Stockpile Stewardship and Management	0[d]
Waste Management	101.9[b]
Total annual cumulative wastewater	2,569.6

[a] These data include nonhazardous sanitary and nonhazardous wastewater discharges.

[b] Data are based on the highest treated volumes from the alternatives scenario.

[Text deleted.]

[c] Number is based on the Collocation Alternative.

[d] The Stockpile Stewardship and Management alternatives at ORR include the downsizing or the phaseout of the secondary and fabrication mission. No additional wastewater discharge is to be expected.

Source: DOE 1995cc; DOE 1995dd; DOE 1996b; DOE 1996m; Table 4.2.5.4–1.

site. Soil erosion and storm water control measures would be used during construction to minimize erosion from the disturbed areas. No valuable geologic resources would be affected by any of the planned programs.

4.7.2.5.6 *Biological Resources*

In addition to ongoing activities and the Storage Alternatives, ORR is being considered for the three other DOE programs identified in Table 4.7.1–1. While some of these programs would be located within existing structures or developed areas of ORR, others would be constructed at undisturbed sites. The total area of undeveloped land would be 154 ha (382 acres), or about 1 percent of the total ORR area. Discharges from the proposed facilities would be directed to Bear Creek, East Fork Popular Creek, and the Clinch River, thus increasing the possibility of cumulative impacts to wetlands and aquatic resources associated with these water bodies. Cumulative impacts to Bear Creek could also increase the potential to affect the Tennessee dace (State-deemed in need of management). The cumulative loss of habitat could lead to additional impacts to special status species compared to those resulting from construction of a storage facility along; however, their status on ORR would not be expected to be jeopardized. Species that could be affected include a number of State-protected plant species such as the pink lady's-slippers, fen orchid, tubercled rein-orchid, American ginseng, purple fringeless orchid, Canada lily, and golden seal.

4.7.2.5.7 *Cultural and Paleontological Resources*

The three other DOE programs identified in Table 4.7.1–1 may require ground-disturbing construction, facility modification, and changes in land access and use at ORR. New construction is proposed for currently undeveloped land within ORR. Some of the undeveloped land has been surveyed. Archaeological sites have been identified on this land and they could be affected by proposed disposition alternatives. [Text deleted.] Prior to construction activity, specific surveys, evaluations, and Native American consultations would be conducted pursuant to NHPA, the *American Indian Religious Freedom Act*, and the *Native American Graves Protection and Repatriation Act*.

New construction and building modification would also occur within Y–12 under several DOE programs. This area is unlikely to contain archaeological, Native American, and paleontological resources because it is developed and disturbed. Y–12 does, however, contain a proposed historic district and many of the facilities are potentially NRHP-eligible. Extensive building modification and new facility construction could compromise the historic integrity of the area. Work would be done in consultation with the Tennessee SHPO and the Advisory Council on Historic Preservation. Cumulative impacts to cultural resources are possible at ORR

because it contains known NRHP-eligible facilities that may be impacted by the storage alternatives as well as other reasonably foreseeable future actions.

4.7.2.5.8 *Socioeconomics*

Cumulative impacts on ORR's regional economy, population, housing, community services, and local transportation would be minor. Generally, the regional economy would improve without burdening the housing market, but new traffic could cause congestion on local roads. Because each of the other three DOE programs identified in Table 4.7.2.5.8–1 is relatively small, their cumulative socioeconomic impact is expected to be minor. The primary impact will be to stimulate regional economic growth. If all of these programs were located at ORR, transportation congestion and the demand for new housing and other public services could increase. However, housing construction trends indicate that this additional population could be accommodated without significant impacts to the housing industry.

Table 4.7.2.5.8–1. Socioeconomic Cumulative Impacts at Oak Ridge Reservation

Program	Direct Employment[a]
Storage and Disposition[b]	566
HEU Disposition	125
Stockpile Stewardship and Management	-805
Waste Management	3,581
Total	3,467

[a] Operations.
[b] Collocation Alternative.
Source: DOE 1995cc; DOE 1996b; DOE 1996m; Section 4.2.5.8.

4.7.2.5.9 *Public and Occupational Health and Safety*

Radiological Impacts. The maximum incremental radiological doses and resulting health effects for the storage alternative, the No Action Alternative, and other actions planned at ORR, are presented in Table 4.7.2.5.9–1. Although these impacts could be added, it should be noted that the exact locations of the facilities for planned actions may change. In addition, because each of these facilities is sited in a different location, the location of the MEI for each is also different. The MEIs have been selected to maximize the potential dose for a given facility. Since the MEI would have to be resident at more than one location simultaneously in order to receive the maximum dose from each facility, summing the doses would be misleading. The offsite population and total site workforce doses have not been summed because the population distribution and workforce totals as analyzed vary among the actions. [Text deleted.]

Chemical Impacts. For ORR, the various NEPA documents use different but otherwise acceptable methodologies to assess the health effects from hazardous chemical exposure for proposed activities. These methodologies may have different indicators for determining the health impact (for example, hazard index, cancer risk, or chemical concentration in the environment). These different indicators prevent a uniform quantitative cumulative impact analysis for this site. However, as indicated in the health impact analysis sections in the NEPA documents for the proposed actions, the health effect from any proposed action at ORR is predicted to contribute only slightly to the impacts from the baseline activity (No Action). The potential cumulative health impact from hazardous chemicals from implementation of the proposed activities would not exhibit a noticeable increase above the baseline, would be expected to fall within acceptable regulatory limits.

Table 4.7.2.5.9–1. Estimated Average Annual Cumulative Radiological Doses and Resulting Health Effects to the Public and Workers From Normal Operation at Oak Ridge Reservation

	Maximally Exposed Individual Member of the Public		Offsite Population Within 80 km		Workers	
Program	Total Dose (mrem)	Fatal Cancer Risk	Total Dose (person-rem)	Number of Fatal Cancers	Total Dose (person-rem)	Number of Fatal Cancers
No Action	3.2	1.6×10^{-6}	34	0.017	44	0.018
Storage and Disposition[a]	4.5×10^{-5}	2.3×10^{-11}	8.7×10^{-4}	4.4×10^{-7}	25	0.010
HEU Disposition	3.9×10^{-2}	2.0×10^{-8}	0.16	8.0×10^{-5}	11.3	4.5×10^{-3}
Stockpile Stewardship and Management	0.20	1.0×10^{-7}	0.60	3.0×10^{-4}	-1.8	-7.2×10^{-4}
[Text deleted.]						
Waste Management	0.58	2.9×10^{-7}	19	9.4×10^{-3}	0.45	1.8×10^{-4}

[a] The impacts from the collocation storage facility are presented since they encompass both Pu and HEU storage.
Source: DOE 1995cc; DOE 1995dd; DOE 1996b; DOE 1996m; Tables 4.2.5.9–1 and 4.2.5.9–2.

4.7.2.5.10 *Waste Management*

Cumulative impacts to waste management at ORR could arise from the activities associated with ongoing activities, the storage alternatives, and the other three DOE programs identified in Table 4.7.1–1. Table 4.7.2.5.10–1 summarizes the estimated cumulative waste amounts. The largest cumulative impacts at ORR resulting from DOE's Waste Management Program would be if ORR were selected as a regional treatment and disposal site for LLW and a regional treatment and disposal site for mixed LLW. It is expected that waste management activities associated with the storage of Pu and HEU would have consistently smaller impacts than any future environmental restoration and waste management activities at ORR, and that the overall impact of Pu and HEU storage would not contribute significantly to cumulative impacts, except for TRU waste.

As part of the Stockpile Stewardship and Management PEIS, a downsize and consolidation alternative for the secondary fabrication mission is being considered. This alternative would decrease the generation of all categories of waste at ORR; therefore, the No Action Alternative would have the greatest negative impact on waste management at ORR.

Table 4.7.2.5.10–1. Waste Management Cumulative Impacts at Oak Ridge Reservation (2005)—Annual Volumes

Category	No Action[a] (m^3)	Storage and Disposition (m^3)	HEU Disposition (m^3)	Stockpile Stewardship and Management[b] (m^3)	Waste Management (m^3)	Total (m^3)
Spent Fuel	0	0	0	0	0	0
High Level						
Liquid	0	0	0	0	0	0
Solid	0	0	0	0	0	0
Transuranic						
Liquid	0	0.02[c]	0	0	Included in solid	0.02
Solid	119	10[c]	0	0	99[d]	227
Mixed Transuranic						
Liquid	0	0[c]	0	0	Included in TRU	0
Solid	0	4[c]	0	0	Included in TRU	4
Low-Level						
Liquid	2,970	2[e]	280[f]	0	Included in solid	3,250
Solid	7,320	1,300[c]	545[f]	0	16,200[g]	25,400
Mixed Low-Level						
Liquid	87,600	0.2[e]	46[h]	0	Included in solid	87,700
Solid	432	66[e]	0	0	3,540[i]	4,040
Hazardous						
Liquid	6,460	2[c]	88[h]	0	Included in solid	6,550
Solid	26	2[c]	0	0	1,120[j]	1,150
Nonhazardous (Sanitary)						
Liquid	550,000	171,840[c]	18,000[h]	0	NA	739,000
Solid	53,100	1,720[c]	410[h]	0	NA	55,200

Table 4.7.2.5.10–1. Waste Management Cumulative Impacts at Oak Ridge Reservation (2005)—Annual Volumes—Continued

Category	No Action[a] (m^3)	Storage and Disposition (m^3)	HEU Disposition (m^3)	Stockpile Stewardship and Management[b] (m^3)	Waste Management (m^3)	Total (m^3)
Nonhazardous (Other)						
Liquid	650,000	0.8[g]	773[h]	0	64,800[k]	716,000
Solid	321	2,200[c]	410[g,h]	0	NA	2,930

[a] No Action volumes are from Table 4.2.5.10–1.

[b] No Action Alternative.

[c] Collocation Alternative (New Pu and HEU Storage Facility).

[d] Represents TRU Waste Decentralized Alternative in which ORR would treat its own newly generated and existing inventory of TRU waste. The volume was obtained by taking the current inventory divided by 20 to get annual estimate (Draft Waste Management PEIS, Vol. I of IV, Table 8.1–1, page 8–4).

[e] Collocation Alternative (New Pu Storage Facility and Upgrade Y-12).

[f] Represents blending HEU to LEU as metal.

[g] Represents LLW Regionalized Alternative 5 in which ORR would treat and dispose of onsite and offsite LLW. The volume was obtained by taking the estimated inventory at ORR plus the inventory and 20-year generation projection for offsite receipts and dividing by 20 to get annual estimate (Draft Waste Management PEIS, Vol. I of IV, Table 7.1–1, page 7–3).

[h] Represents blending HEU to 4 percent LEU as UNH.

[i] Represents mixed LLW Regionalized Alternative 4 in which ORR would treat and dispose of onsite and offsite mixed LLW. The volume was obtained by taking the estimated inventory at ORR plus the estimated inventory and 20-year generation for offsite receipts and dividing by 20 to get annual estimate (Draft Waste Management PEI Vol. I of IV, Table 6.1–1, page 6–3).

[j] Represents the estimated hazardous waste to be treated at ORR as a result of hazardous waste Regionalized Alternative 2 (Draft Waste Management PEIS, Vol. I of IV, Table 10.3–7, page 10–20).

[k] Represents the total incremental annual wastewater over No Action for all alternatives. Annual volume was obtained by assuming 365 days per year (Draft Waste Management PEIS, Vol. II, Tables II-10.3–11 [TRU], page 10–45; II-10.1–15 [mixed LLW], page 10–17; II-10.2–12 [LLW]. page 10–33; and II-10.5–10 [hazardous], page 10–58).

Note: NA=data was not analyzed in the associated PEIS.

Source: DOE 1995cc; DOE 1995dd; DOE 1996b; DOE 1996m; Table 4.2.5.10–1.